1-1-1900

User's Guide to the General Soil Maps and Interpretative Data for Counties of Indiana (Supplement to the AY-50 Series)

H. M. Galloway

J. E. Yahner

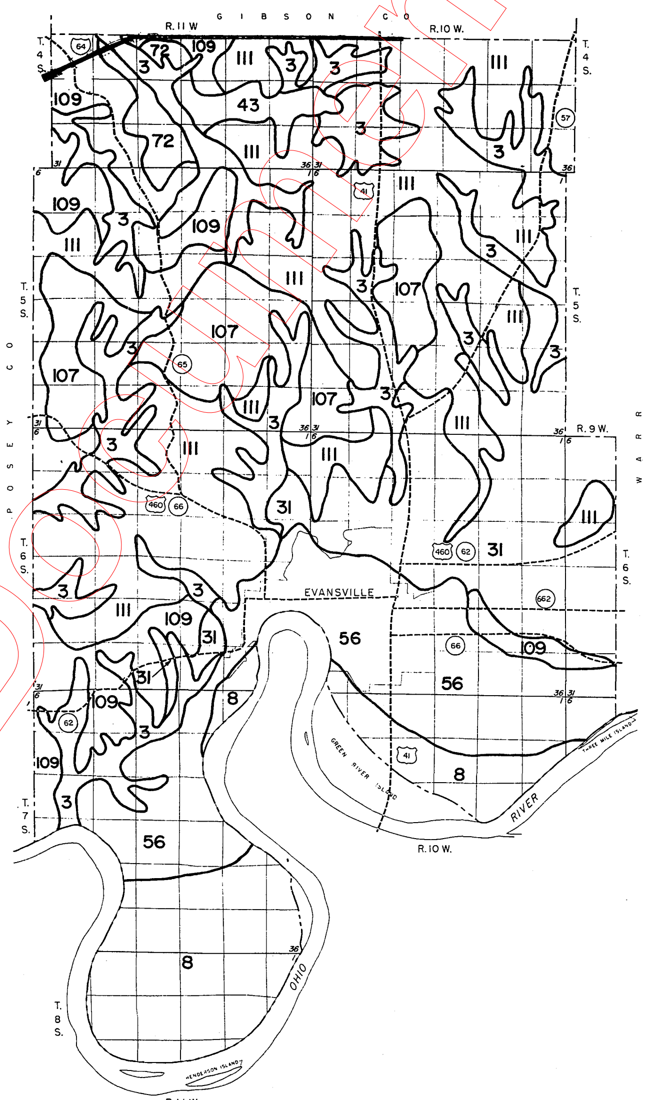
G. Srinivasan

D. P. Franzmeier

Adm - yes

Soil Map Users Guide General County

Supplement to AY-50 Series



User's Guide

to the General Soil Maps and Interpretive Data for Counties of Indiana

Purdue University
Cooperative Extension Service /Agricultural Experiment Station
West Lafayette, Indiana
in cooperation with
the Soil Conservation Service
U.S. Department of Agriculture

APPENDIX

Cooperative Extension Work in Agriculture and Home Economics, State of Indiana, Purdue University and U. S. Department of Agriculture Cooperating. H. G. Diesslin, Director, West Lafayette, Ind. Issued in furtherance of the Acts of May 8 and June 30, 1914. It is the policy of the Cooperative Extension Service of Purdue University that all persons shall have equal opportunity and access to its programs and facilities without regard to race, religion, color, sex or national origin.

User's Guide to the General Soil Maps and Interpretive Data for Counties of Indiana

H. M. Galloway, J. E. Yahner, G. Srinivasan
and D. P. Franzmeier, Agronomy Department

The General Soil Maps series is a useful and informative addition to our knowledge of Indiana's land resources. The maps, available since 1971, have recently been analyzed to characterize soil associations. Percentages of soil units in each association were estimated from 1958-60 soil and land use mapping. Then Soil Conservation Service scientists mapped and compiled data from samples selected statistically by counties to estimate soils and uses of Indiana's lands, as a part of the Conservation Needs Inventory (CNI).

This publication is a guide to use of the General Soil Maps (AY-50 series) as revised in 1975. In the book of maps covering all of Indiana, the accompanying summaries of soil associations appear on the backs of the maps or on adjoining pages. You can find help in understanding what they show, how they can be used, and how they were assembled in this guide.

A QUICK SUMMARY

The 92 county general soil maps of the AY-50 series (Purdue University Cooperative Extension Service and USDA Soil Conservation Service) originally issued in 1971 show 108 soil associations, each on a characteristic landscape and named for the two to four principal soil series included. Legends describe their relief, drainage, and parent materials. Such maps have been widely used to show where main soil areas occur and have proved valuable for many types of comprehensive planning. These maps are clearly not meant to be substitutes for the detailed soil survey information needed for evaluating specific tracts of land. They are a distinct and valuable form of soil map useful in their own right. They provide a broad look at soil resources.

Data in this publication have made these maps more useful by quantifying soil series and the slope-erosion groups on which they occur for each association. A number of interpretations deal first with entire associations and, later, with the counties, based on the percentage which each included association makes of that county. These are reported on revised general soil maps (1975), and the methods are described.

County maps show percentage of included associations, percentages of poorly drained, alluvial, and muck, and percentage of Class I-IV land (useful for cropland). Yield estimates include corn, soybeans, wheat, and hay, and also percentage of potential increase above the yield estimates. Productivity indexes consider yield potential and production costs. Other indexes show water and wind erosion and irrigation potential. Average percent organic matter and percent suited for septic use are listed. Finally, land use as of 1958 is given in five classes for each association.

These maps and analyses have already proved useful in many ways, including:

studying proposed projects involving use of large land areas; relating productivity to "prime agricultural lands"; comparing soil associations for competing land uses; locating agribusiness by land resources; judging values for general alignment of utility rights of way; equalizing tax assessment processes; and in research involving watersheds and soil-hydrologic regimes.

Cautions

The small scale of these maps does not allow for locating individual soils within the associations. In many cases values of the individuals may be different from each other and from aggregate values of entire associations. So these maps can not be relied on for detailed estimates of productivity, land-use adaptations, or land values on tracts the size of typical Indiana farms. For such values, consult detailed soil maps and reports which are on scales 10 to 12 times as large.

Data interpreted from associations and reported in tables on the general soil maps are not calculated specifically for one county alone but represent values for an entire soil association. Likewise, land-use percentages are not those for any one county but reflect land-use averaged across all the counties in which the association occurs.

Individual soil properties vary more in some associations than in others, producing a wider spread in values between them. Variations are greatest in the humpy, relatively sandy associations on terrace or outwash plains such as Nos. 24, 35, 39, 40 and 42. Among the more variable of the upland till plain associations are Nos. 63 and 79, especially where these abut areas of the outwash associations just listed.

These maps and data, if used wisely, are destined to play an important role in Indiana's future planning for agriculture, forestry, and community development.

GENERAL SOIL MAPS AND INTERPRETATIONS FOR INDIANA COUNTIES

We all recognize different landscapes as we move about our home counties or as we travel in less familiar areas. Level and gently sloping land planted to corn and soybeans, or pastures and woodlands on sloping and steep lands are landscapes commonly seen. We sense that there are different soils or proportions of soils in each landscape.

What Is a General Soil Map?

The 92 county general soil maps in the AY-50 series[1] display natural soil landscapes which we call soil associations. Each of the 108 associations has a characteristic topography and repeating pattern of soils wherever it occurs. Each may occur in one or more counties (Table A-2).

The first nine associations, about 8 percent of Indiana, contain mostly alluvial soils of the overflow bottomlands or flood plains subject to present day overflow. The next 48, comprising about 19 percent, are mostly of terrace or outwash and lacustrine (lake) plains which are on water-laid materials on level or generally smooth areas. Associations 58 through 116 total 73 percent of Indiana and are mostly upland soils lying above flood plains and outwash terraces or lake plains. Association 108 is largely peats and mucks associated mostly with outwash and lacustrine plains.

Soil Conservation Service soil scientists, in cooperation with Purdue agronomists, prepared these 92 county general soil maps at scale of 3 miles per inch in 1971. They drew them at a uniform scale, using a single legend which included all important associations then known in Indiana. The associations are named for the principal soils, and the order of naming indicates relative amounts of each soil. The legends on each map mention principal soils and their relief, drainage, and parent materials.

For example, maps of Adams and other nearby counties indicate a central Indiana soil association No. 62, Blount-Pewamo, which the legend describes as "nearly level, somewhat poorly drained, clayey Blount and very poorly drained, clayey Pewamo in glacial till." Note that the summary of soil associations for Adams County (Table 2) shows that 76 percent of this association has A or 0-2 percent slopes. The dominant problem of this level soil area is poor natural soil drainage. It borders or is surrounded by areas of No. 86, Morley-Blount. This includes large areas of sloping, well drained, clayey Morley and lesser areas of level, somewhat poorly drained Blount soils, all developed in parent materials similar to those of No. 62. Note that it has only 43 percent level A or 0-2 percent slopes. The B, C, D, and > D slopes apply only to the moderately well and well drained St. Clair, Miami, and Morley soils in the association (see Assn. 86, Appendix Table A-1).

How Are General Soil Maps Useful?

Although general soil maps are useful for many purposes, the users need additional information about associations to assess effects of present and potential land uses over broad land areas. They also need means by which to list the broad characteristics of each association for predicting advantages or risks in using lands. We lacked ability, for example, to determine the consequences of changing large land areas from farming to housing uses or from row crops to forage crops or from pasture to row crops. Such questions continually arise as we look toward making decisions on land uses where both community and individual good must be compared. An example is the present trend to try to define "prime agricultural lands" when retaining these lands for agricultural use competes with many other demands.

Our experiences to date in using these general soil maps and analyses show them to be useful in many ways:

1. General soil maps provide means of rapid over-all assessment of projects proposed for large land areas. A need arose in 1972 to understand Indiana lands proposed as potential land treatment sites for Chicago area wastewater cleanup. Detailed soil maps were available for only two of four counties affected. By using general soil maps and analyses, we quickly determined that 80 percent of the proposed area was high water-table sands and less than 20 percent was droughty sands where crops might benefit greatly by added water. Very little of these droughty sands are in cultivation. Such facts were adequate for discussion at that stage. It would have required weeks instead of hours to analyze this proposal by any other means.

2. In developing guidelines for general land-use allocations between agriculture and competing uses, these resource data allow us to compare alternatives concerning direction of growth and consequences of land-use changes around our cities and towns. Two associations in west central Indiana offer a clear comparison. Association 66, Fincastle-Ragsdale, is on smooth till plains with somewhat poorly drained, light colored Fincastle soils on the nearly level rises and dark Ragsdale soils in the depressions. Association 81, Miami-Russell, contains better drained soils grading between these smooth areas in No. 66 and the small stream valleys. Both are heavily cropped and both are in the path of housing development where sewers aren't available and probably will not be for some time. Properties of these two associations are indicated in Table 1. Selection of attractive housing sites using on-site sewage disposal is much more likely in No. 81. Its diversion to housing would cause at least 50 percent less loss to agriculture than use of No. 66. More wooded areas and slopes in No. 81 add variety to the landscape and, although erosive under rowcrops, it would be considerably less so after stabilization in a new land use.

3. Productivity potential and other characteristics of specific areas help determine

Table 1. Selected Factors for Two Contrasting Central Indiana Associations and Land Use Possibilities.*

Assn. no.	Percent poorly drained (Col. 3)	Percent cropland (Col. 19)	Potential corn yield: Most years (Col. 8)	Potential corn yield: Best years (Cols. 8 & 12)	Percent suited septics (Col. 18)	Notes
66	81	81	133	185	8	Level, highly productive grainland. Continuous cropping.
81	30	65	108	140	39	Rolling, productive grainland. Corn safe in rotation only 1/2 to 2/3 time.

*Column numbers used here and throughout this text refer to position of data in summary of soil associations tables (see Adams Co., Table 2).

qualities of "prime agricultural lands." Productivity records are commonly available on a soil-type basis, but production figures related to larger land areas are not available. Soil Conservation Service and Cooperative Extension Service are considering use of maps and analyses to display "prime agricultural lands." These will be useful to local people as they discuss establishing land use policies in Indiana. Table 3 offers such a comparison of associations.

4. Agribusiness location and product distribution problems are related to productivity, drainage needs, irrigation potential, organic matter content of soils, or erosion potential. A chemical firm seeking to assess its future market for chemicals closely associated with organic matter found the maps and analyses useful in preliminary stages of their studies.

5. Equalization of values are needed for tax assessments or utility right-of-way location. Both of these depend partly on basic soil productivity. The State Board of Tax Commissioners has found the maps and analyses useful to field men and in relating productiveness and productivity indexes between townships, counties, and other units. General soil maps are not appropriate for individual farm appraisal because productivity ratings of individual soils within each association vary widely. (See Appendix Table A-1)

6. Research studies relating to soil-hydrologic regimes in watershed and basin planning are underway. They require a soil input which is difficult to achieve from detailed large-scale soil maps. Equations are being attempted to relate general soil maps and analyses to improve predictability of runoff expectations in modeling studies of selected small watersheds by hydraulic engineers.

INTERPRETIVE DATA SHOWN FOR EACH SOIL ASSOCIATION

Many types of information could be presented for each association. The data selected, as on the Adams County summary of soil associations (Table 2), are chosen for usefulness and represent information most frequently needed and requested. Column numbers used throughout the text indicate the position of data in the summary of soil associations tables.

Percent Poorly Drained Soils (Col. 3)

Natural soil drainage as used in this summary includes poorly, somewhat poorly, moderately well, and well drained soils. A percentage of poorly and somewhat poorly drained soils was calculated for each association, representing those soils with probable water-table problems.

Because natural drainage is such an important determinant of land use and management practices needed in Indiana, this is

Table 2. Interpretive Data for Soil Associations in Adams County.

SUMMARY OF SOIL ASSOCIATIONS -- ADAMS COUNTY (220,700 acres)

Assn. no. 1	Pct. in county 2	Pct. PD SPD 3	Pct. Allu-vial 4	Pct. muck 5	Pct. I-IV land 6	Yield estimates in bushels or tons (hay): I-IV soils corn 7	Yield estimates: All soils: Corn 8	Yield estimates: All soils: Soy-bean 9	Yield estimates: All soils: Wheat 10	Yield estimates: All soils: Hay 11	Pct. poten. incr. 12	Avg. prod. index 13	Index potential for: Water eros. (1-4) 14	Index potential for: Wind eros. (1-3) 15	Index potential for: Irri-gation (1-4) 16	Avg. pct. OM 17	Pct. suited for septic 18	Land use (pct. of assn.): Crop land 19	Land use: Pas-ture 20	Land use: For-est 21	Land use: Idle 22	Land use: Ur-ban 23
1	.88	36	47	0	99	114	113	40	47	3.7	40	64	1.5	1.0	1.0	2.4	7	67	4	14	1	14
18	8.15	32	25	0	97	105	105	37	46	3.5	38	56	2.1	1.0	1.7	2.3	39	63	13	12	3	9
62	73.50	88	1	1	99	109	109	38	49	3.6	39	54	1.8	1.0	1.0	3.1	0	79	5	8	3	5
86	16.42	45	4	3	97	98	97	34	43	3.2	37	43	2.6	1.0	1.0	2.2	6	71	10	11	3	5
108	1.03	90	0	64	99	121	120	42	49	4.0	25	68	1.1	1.9	1.3		9	69	10	5	6	10
Weighted Avg.*		76	4	2			106	38	47	3.5	38	53	1.9	1.0	1.0	2.8	4	76	7	9	3	5

<u>General</u>: Calculations were made to represent average values for each association across its entire area in Indiana. In a particular county, values may be somewhat different. Except for cols. 6 and 7, calculations consider use of all soils in the association. Individual soils may have values well above or below the averages reported here. Weighted averages (*) are calculated taking into account the area of each association within the county.

<u>Notes by columns</u>:

3. Natural soil drainage: PD (poorly drained), SPD (somewhat poorly drained). Others considered were moderately well and well drained.
4. Subject to periodic flooding unless protected by dikes or levees.
5. Organic areas in low landscape positions with or without surface outlets.
6. Percent tillable, Classes I-IV by SCS Land Capability Classification.
7. Present average yield on Classes I-IV (better row-crop soils) without irrigation.

8-11. Present average yields on Classes I-VII (all soils) without irrigation. For yields on Class I-IV only, multiply values in col. 7 by .35 for soybeans, by .40 for wheat and divide by 30 for hay (tons).

12. Percent potential increase over yields in cols. 8-11 with excellent management in best growing seasons.
13. Productivity index = average gross return minus production and conservation costs (highest index = 100).

14-16. Col. 14, 1 (slight) to 4 (severe); col. 15, 1 (slight) to 3 (severe); col. 16, 1 (low) to 4 (high) response for grains.

17. Muck soils (usually over 30% organic matter) not included in calculation. No percent OM given for Assn. 108.
18. Soils with slight and moderate limitations by SCS system. Rest have severe limitations.

19-23. Land use calculated from Indiana soil and water conservation needs inventory data for 1958.**

<u>Percent of Land by Slope Groups</u>
(Gradient by groups: A 0-2%, B 2-6%, C 6-12%, D 12-18%, E 18-25%, F 25-35%, G > 35%)

Assn.

1 A= 85 B= 10 C= 4 >C= 1
18 A= 70 B= 18 C= 9
D= 2 E= 1
62 A= 76 B= 20 C= 3 >C= 1
86 A= 43 B= 36 C= 16
D= 3 >D= 2
108 A= 94 B= 5 >B= 1

** Does <u>not</u> indicate exact land use in a particular county.

considered a prime indicator of an association's land-use potential.

Remember that these are natural drainage classes and do not reflect the completeness of artificial drainage installed to correct wetness in crop fields or in construction. The percentage composition of soils in each association (Appendix Table A-1) indicates the percentage of each of the four drainage classes included.

Percent Alluvial Soils (Col. 4)

This indicates the proportion of an association lying in flood plains and subject to overflow at varying intervals according to position and relative elevations in these floodplains. Percentages of such alluvial soils are high in each of associations 1 through 9. (See Table 2, Col. 4, Assn. 1)

The level of generalization of association boundaries on the general soil maps is such that small areas of terrace or upland soils are probably included with bottomlands. Conversely a terrace (No. 18) or an upland association (No. 86) which borders the alluvial association (No. 1) can include small areas of alluvial bottomland soils.

Percent Muck (Col. 5)

Significant areas of organic soils are in northern Indiana. Association 108 (Table 2, Col. 5) is principally of organic soils, but others may contain smaller percentages of mucks. These usually lie low in the landscape and were formed in areas once under water for all or part of the year because surface outlets for water were lacking. Many areas have had land improved for cropping. Column 5 reports the percentage of mucks found in each association. Generally, the thickness of muck over mineral substrata varies widely from a minimum of about 1 foot to more than 4 feet.

Percent Capability Classes I to IV Land (Col. 6)

The land-use capability system used by Soil Conservation Service [2] places soils capable of cultivation without deterioration under good management in one of the first four classes (I to IV). On deep, well drained soils these usually include slopes up to 18 percent where erosion is not severe. On moderately deep soils over rock or other subsoil restrictions, these include slopes up to 12 percent. On deep, dry sandy soils, slopes only up to 6 percent are included.

The composition of each association in terms of land capability classification was calculated by percentages of Classes I-IV land which, when combined with average yields and other criteria, allows a quick estimate of the cropland potential.

Crop Yield Estimates (Cols. 7-11)

Soil Conservation Service and Purdue soil scientists computed estimated yields for each of Indiana's soil series under natural rainfall for corn, soybeans, wheat, and hay. [3] Corn yield levels, estimated to be those achieved over some years by the top 20 percent of Indiana producers, were intended as goals which could be achieved by other producers with proper inputs; they were not expected to indicate average yields for each soil. They appear to be 15-20 percent higher than the yields reported from 1964 to 1974 in the annual crop summaries prepared by the Statistical Reporting Service, USDA, and the Agricultural Experiment Station of Purdue University. [4] These yield estimates are probably closer to averages than those listed on the AY-50 data tables. However, no matter what yield level is finally adopted as an "average," the data in AY-50 series still allow relative comparisons.

Soil properties affecting yield potential were related to production levels achieved on well-documented benchmark or index soils. Properties affecting yield include those related to the internal soil itself to a 40-inch depth as affected by natural soil drainage, soil slope, and effects of past erosion (thickness of remaining topsoil). Water-holding capacity of soils to 48 inches was considered in making these estimates.

Corn Yield Estimates: I-IV Lands Only (Col. 7)

Yield estimates for corn are often higher on Classes I-IV soils (Col. 7) than on all soils (Col. 8). On nearly level associations the two yield estimates will be similar. On hilly associations containing much sloping, shallow soil the estimate of yield on cropland is more realistic in Column 7 figures for I-IV lands only, because very little land in classes above IV is used for corn production.

Corn Yield Estimates: All Soils (Col. 8)

This assumes that all tillable soils of an association were cropped to corn regardless of capability class. In associations with lower percentages of Class I-IV lands the yield estimates for corn are considerably lower than on associations with high percentages. Examples are in associations 105 and 106, containing many rough, shallow sandstone soils, where yield estimates are, respectively, 58 and 41 bushels for all tillable soils. When only soils of Classes I-IV are used, yield estimates are 82 and 75 bushels.

Soybean Yield Estimates: All Soils (Col. 9)

These are based on the normal yield relations of (corn x 0.35) based on corn yields of all soils (Col. 8). If yield potential on Class I-IV soils only is desired, the ratio of corn yields on I-IV soils (Col. 8) to corn yields on all soils (Col. 9) can also be applied to soybeans.*

Wheat Yield Estimates: All Soils (Col. 10)

These are based on the normal yield relations of (corn x 0.40) based on corn yields of all soils (Col. 8). On some droughty soils wheat may be proportionally more productive with a factor closer to (corn x 0.45).

If yield potential for Class I-IV soils only is desired, the ratio of corn yields on I-IV soils (Col. 8) to corn yields on all soils (Col. 9) can also be applied to wheat.*

Hay Yield Estimates: All Soils (Col. 11)

Yields in tons are based on the normal yield relations of bu. corn yield ÷ 30. This may vary widely according to management. If yield potential on Class I-IV soils only is desired, the ratio of corn yields on I-IV soils (Col. 8) to corn yields on all soils (Col. 9) can also be applied to hay.*

Percent Potential Increase (Col. 12)

This value expresses an estimated percentage responsiveness to superior management. In good years some farmers obtain yields well above present estimates for the top 20 percent of producers. Values of responsiveness for each soil expressed as bushel increase of corn[5] were used, and an average association responsiveness for corn was calculated. The percentage potential crop increase was determined by dividing potential bushel increase by yield estimate level in bushels. The potential increase responsiveness percent for corn was assumed to be valid for soybeans, wheat, and hay. This relation seems fairly constant across most soils.

Note that there is a range in percent potential increase among associations even in one county (Table 2).

Average Productivity Index (Col. 13)

These indexes rate soils in terms of relative net earning capacities and allow soil comparisons for land appraisal and assessment.[6] Soil Conservation Service and

*Little difference will occur unless yield of corn for all soils is 2 or more bushels below corn yield for classes I-IV lands.

Purdue agronomists determined productivity indexes for each soil mapping unit.[3]

The Productivity Index (PI) was calculated as follows:

PI = gross return - cost of production - cost of conservation practices, where:

- gross return is the yield of corn multiplied by an assumed price;
- production costs include fertilizer, seed, tillage, etc., but not land costs;
- cost of conservation practices includes amortized costs such as for drainage or terrace installations and crop rotations needed to control erosion.

The rotation costs are important on sloping soils since the most profitable row crops must be alternated with lower-profit small grain and forage crops as illustrated for two associations in Table 3.

An average productivity index was calculated for each association. Again, average productivity indexes for farms may vary widely within an association because soils vary naturally within each association. Though calculations utilized representative prices and costs of 1972, the productivity index is relatively independent. Generally, crop prices and production and conservation costs vary more or less together, so relations between them are fairly constant.

Index Potentials for Water Erosion (Col. 14)

Considering its use as cropland, potential water erodibility[5] was assigned to broad drainage and slope groups as listed.

None = (1): All poorly drained soils and all bottomlands, usual slopes 1 percent or less

Slight = (2): All somewhat poorly drained soils, usual slopes 1-2 percent

Moderate = (3): All moderately well and well drained soils on slopes of 2-6 percent

Severe = (4): All moderately well and well drained soils on slopes above 6 percent

An index was calculated for each association. Indexes between 1 and 2 are considered low; 2-3, moderate; and 3-4, severe in potential for water erosion when in row crops. Compare sloping association 86 with more level association 62 in Adams County. The percent of slope groups by associations is given in the lower right corner of Table 2.

Index Potentials for Wind Erosion (Col. 15)

Potential wind erodibility[5] was assigned,

Table 3. Comparison of Percent Cropland, Percent Class I-IV Lands, Corn Yields for Class I-IV Only, and Productivity Index for Two Central Indiana Associations.

Assn. no.	Soil association	Nature	Percent cropland (Col. 19)	Percent Class I-IV lands (Col. 6)	Bushel corn yield Class I-IV (Col. 7)	Prod. index (PI) (Col. 13)
66	Fincastle-Ragsdale-Brookston (Continuous corn possible on much of this land.)	Smooth upland	81	99	133	79
81	Miami-Russell-Fincastle (Corn safe in rotation only 1/2 to 2/3 of time on much of this land.)	Gently rolling upland	65	90	108	51

Estimated corn yield is 25 bushels (19%) lower on No. 81 than on 66, but there is a 35% difference in productivity index. This reflects greater conservation practice costs on the soils of No. 81 than on those of 66, because lands are more rolling and larger proportions of cropland must be in sown or sod crops annually to protect them against erosion. Also a lower proportion are suited to farming with large machinery, and more remains in pasture or forest or is idle.

considering use of the soils for cropland as follows:

Slight = (1): Loams, silt loams, clay loams, and clay surface textures

Moderate = (2): Sandy loam surfaces

Severe = (3): Loamy sand, sand, and muck surfaces

An index was calculated for each association. Those between 1 and 1.5 are considered to have a slight hazard; 1.6-2.2, moderate hazard, and 2.3-3.0, severe hazard for wind erosion. In some associations sandy surface soils may occur on only a small proportion of the area, and the association has slight hazard over-all but severe hazard locally. Compare association 62 (level mineral soils) with association 108 (muck soils) for Adams County, and note how mucks have a higher wind erosion hazard.

Index Potentials for Irrigation (Col. 16)

This assumed that yields in deep loam and silt loam or finer textured soils overall would not respond sufficiently to make irrigation profitable for grain crops at historic average corn price/cost ratios,[5] but that sandier soils would respond favorably as follows:

None = (1): Little or no profitable response

Slight = (2): Response 1-2 years in 5

Moderate = (3): Response 3-4 years in 5

High = (4): Response expected yearly

An index of responsiveness by corn was calculated for each association. Those between 1 and 2 indicate slight response overall even though some soils may have high response. Between 2 and 3 response should be moderate; above 3 the response will be high. Compare lower water-holding capacity soils of association 18 in Adams County with more clayey soils with higher water-holding capacities in association 62.

Average Percent Organic Matter (Col. 17)

By assigning percent organic matter to mapping units, scientists estimated the average percent organic matter of surface soils for each association. Indiana surface soils generally range from 1 to more than 4 percent organic matter (mucks excluded). Light-colored, well drained sands usually have less than 1 percent; light-colored, somewhat poorly drained soils and dark-colored sands from 1 to 2.5 percent, and well drained prairie soils from 3 to 4 percent. Poorly drained depressional soils usually have about 4 or 5 percent but range up to 7 or 8 percent.

Organic content of soils of most associations (light and dark pattern of many areas) ranges widely. Compare the figures for rolling association 86 with association 62; the latter has a larger amount of depressional, poorly drained soils. Note that no value is given to association 108, which is mainly of muck soils having 30 percent or more organic matter.

Percent Suited for Septics (Col. 18)

This expresses the percent of the area of an association expected to have only slight or moderate limitations for use of septic systems, rated according to the system used by Soil Conservation Service.[7] This figure may be thought of as the "odds" of finding a suitable location for a septic system in the mapped area. You will need to consult detailed soil maps to locate specific small tracts suitable for use of septic tile fields.

Compare association 18 (Table 2), mostly of terrace soils, many of which have sand and gravel substrata, with other associations. Although chances are good that septic tile fields will function well on such soils, remember that concentrations of homes may contaminate the ground water supply.

A numeric system was devised to allow continuous ratings from soils best suited for absorbing wastes (close to 100) to those poorest suited (close to 1). Soils rating below 78 are considered severely limited,[7] but those below 68 and below 49 are considered very severe and extremely severe ratings (Table 4). In soils with severe rating, chances are good that limiting factors can be overcome by construction techniques

Table 4. Properties of Four Soil Associations, Percent of Each by Septic Rating and Adaptation to High Density Housing Usage of Soil Absorption Septic Systems.

Assn. number and name	Terrain	Pct. level (0-2%)	Pct. 1/ poor and somewhat poor drainage	Numeric and descriptive septic ratings 2/ >88 Slt.	87-78 Mod.	77-69 Sev.	68-49 V. sev.	< 49 Ext. sev.	Unsuited (overflow)	Dominant soil factors	Value for high-density housing 3/
66 Fincastle-Ragsdale	Nearly level	80	81	0	8	8	51	31	2	Wetness, slow perm. subsoils	Very low
81 Miami-Russell-Fincastle	Gently sloping	39	30	3	36	14	23	16	5	Slopes, some wetness	Moderate
91 Avonburg-Clermont	Nearly level	83	85	0	0	8	48	40	2	Wetness, very slow perm. fragipans 4/	Very low
105 Wellston-Zanesville-Berks	Hilly	8	4	0	0	10	15	67	6	Steep slopes, v. slow perm. fragipans, 4/ shallow soils	Very low

1/ Remaining portion is moderately well or well drained.
2/ Do not all total 100. Misc. soils not classified by soil properties or assigned septic ratings.
3/ Considering high-density housing (as in subdivisions) based on lots of an acre or less.
4/ Natural slowly permeable subsoil pan layers 1 to 2 feet thick below 20 to 30 inches over which water seeps in down slope direction.

and greater expenditures, but soils with extremely severe ratings may be nearly impossible to use with reasonable costs.

Table 4 shows data for "slope percent" and "percent poor and somewhat poorly drained soils" for four contrasting associations and composite percentages of numeric ratings for six suitability classes for septics. This indicates that slope, natural drainage, and overflow potential all must be considered in rating associations for use of on-site sewage systems.

Generally, level lands and poor drainage go together, and these do much to explain the low percentage suitability of associations 66 and 91. The more sloping No. 81 has 39 percent suitable (slight + moderate) for septics because of adequate runoff and generally drier soils. Soils of No. 105 are generally sloping yet have many soils which are shallow to rock or have fragipans. The shallowness of absorptive soils accounts for No. 105 having no slight and moderate ratings for on-site sewage disposal. Association 105 also has the most extremely severe ratings. Septic effluents seep downslope over the fragipan or rocky subsoils toward watercourses.

Table 4 also indicates that overflow hazard restricts use of some soils for septics and causes them to be unsuitable. The dominant soil factors limiting use are given, and an over-all subjective rating is shown as a means of finally evaluating the four associations.

Land Use Percent of Association (Cols. 19-23)

This calculates 1958 land use as found during the Conservation Needs Inventory[2] for an entire association. It does not show actual land use for any given county where that association occurs, but it does estimate the average land use across the entire association. Land use is given in five classes: cropland, pasture, woodland, idle (including farmsteads), and urban. Urban includes built-up areas over 10 acres, airports, roads, railroads, etc.

Remember that these estimate actual 1958 land uses rather than recommended uses based on soil qualities. For many reasons, associations in some counties may have land uses very different from the average for that association across its entire range. Likewise the weighted average county land uses may differ from those obtained from other information sources.

The size of contiguous areas of more level lands (mostly Class I and II) in an association influences its use for cropland. For example, Class I and II land that occurs in small, scattered areas will not be farmed as intensively as if the same land had occurred in larger contiguous tracts.

A few reasons for odd land use percentages in certain counties or areas follow: The federal military reservation in Jefferson County, mostly on association 91, lowers the amount of normal cropland in that county. Strip mine operations in Greene, Sullivan, Pike, and surrounding counties have lessened all classes of agricultural land in several associations since 1958. The fact that association 108 shows 10 percent urban land use reflects the intensive use of such soil areas surrounding northern Indiana lakes and towns. Intimately associated with the mucks in No. 108 is 35 percent of mineral soils, and chances are good that a great deal of urban land may be on them rather than on the muck itself.

REFERENCES

1. General Soil Maps of Indiana. 1971. CES & USDA-SCS (Indiana) AY-50 Series, Purdue University Cooperative Extension Service, W. Lafayette, Indiana.

2. Indiana Soil and Water Conservation Needs Inventory. 1963. Purdue University Cooperative Extension Service, W. Lafayette, Indiana.

3. Predicted Yields and Productivity Index for the Soils of Indiana (Draft Copy) May 1973. USDA Soil Conservation Service, Indianapolis, Indiana. In cooperation with Purdue University Agricultural Experiment

Station.

4. Indiana Annual Crop and Livestock Summaries. USDA Statistical Reporting Service and Purdue University Agricultural Experiment Station.

5. Farm Planning and Financial Management. Rev. 1975. ID-68. Purdue University Cooperative Extension Service, W. Lafayette, Indiana. pp. 21-27.

6. Using the Soil Survey for Land Assessment -- A Computer Method. 1975. Purdue University Agricultural Experiment Station Bulletin 93.

7. Guide for Interpreting Engineering Uses of Soils. 1971. USDA, SCS Soil Survey Staff. p. 87.

8. Land Resource Regions and Major Land Resource Areas of the U.S. 1965. Agri. Handbook 296. USDA-SCS, Washington, D.C.

Appendix

HOW MAPS WERE MADE AND DATA DEVELOPED

General soil maps were initially drafted in 1970. The legend used was judged by correlators to best represent the various associations of soils occurring in Indiana. The legend consisted of the names of the two to four series estimated to constitute the major part of the association and included 116 associations.

Soil Conservation Service (SCS) soil scientists then drew the maps from the best available sources. In some counties the source was a modern detailed soil survey, in others it was older published surveys, and in some the source was unpublished general soil maps supplemented by some detailed but unpublished soil mapping.

Soil scientists at Purdue then integrated the individual county general soil maps into a statewide system. In the process 8 units were removed from the legend, leaving only 108. These maps were matched and joined and were published in 1971 as the AY-50 series. A few maps were slightly altered and the series revised in 1975.

SOIL AND LAND USE ANALYSES SINCE 1971

Soil mapping and land-use data gathered during the 1958 USDA Conservation Needs Inventory (CNI) were used to learn soil components and land uses of each association. Randomly selected quarter sections of 2 percent of Indiana had been mapped during the study and averaged 3 quarter sections per township of 36 square miles, or 13-54 per county, depending on size. In 1963 Purdue Cooperative Extension Service published summaries of capability classes and subclasses by counties for cropland, pastureland, forest-woodland, and other land. [2]

CNI Quarter Section Samples Used to Quantify Soil Composition by Series

Quarter section samples were first located on the soil associations of the 92 county general soil maps. Those occurring at the edges of associations were proportioned between adjoining ones. From those maps, scientists tallied the acreage of all soil series by associations and calculated the percentage of a soil series by dividing the acres of soil series by the total CNI sample acreage for the association.

Soil Conservation Service acreage calculations on CNI sample maps had been compiled within a broader grouping called State Land Resource Areas (35 in Indiana further subdivided in some cases), boundaries of which often coincided with those of the soil associations. [8] This eased the task of proportioning soil acreages between associations which divided a given quarter section and allowed more accuracy than originally anticipated. For example, on sample soil maps where CNI quarter sections were astride boundaries of bottomlands and uplands, workers tallied soils so that alluvial soils were credited to bottomland associations and upland soils to upland associations. This process improved composition estimates.

In tallying soil series by associations, the primary differentiation was natural drainage class. Component soils comprising 1 percent or more of an association were listed by name. Those of less than 1 percent were retained within their drainage classes as miscellaneous (misc.) components. Knowledgeable soil scientists of SCS and Purdue updated soil series names as needed to agree with the 1972 classification.

These summaries are reported in Table A-1. This formed part 1 of a soil association data bank file to be used in further calculations with computer facilities.

In 1970 soil scientists assigned association names according to their estimates of main component soils in order of occurrence. These names are not always in the exact order of dominant soils, as revealed by CNI sample map summaries reported in Table A-1. Also, in 1975 a few maps were slightly revised.

Association names on the AY-50 series maps may not agree exactly with names used for associations on the colored general soil maps in recent published soil surveys. These recognize a similar soil pattern, but soils may occur locally in different proportions than they do across the entire extent of an association.

Estimating Slope and Erosion Components of Soil Associations

A summary of the acreage by soil type and by slope and erosion classes was available from SCS as a product of the CNI. Workers used this to compute the percentage chances of each soil series occurring in one of the seven slope classes (range of 0 to > 35 percent) combined with one of three erosion classes. (1. none to slight, 2. moderate, and 3. severe erosion) They recorded these percentages by series to form part 2 of the soil association data bank file.

Combining data bank files 1 and 2 produced an accurate estimate of the soil mapping unit composition of each association, including series by slope and erosion classes. Acreages of different soil types in a single soil series were combined and reported as one series.

A large computer card file, combining the two files and maintained in the Agronomy Department at Purdue University, formed the base from which the various association interpretations were computed.

For each mapping unit in the soil data bank file, values such as yield, erosion potential, and organic matter content were entered on computer cards. An entire association could be characterized in terms of these factors. Results are reported as the weighted average values for associations on the backs of the AY-50 series general soil maps.

Having measured the acreages by association in each county, workers could easily recalculate the weighted average production figures and indexes for associations for counties.

In calculating summaries regarding crop yields, potential production increase, indexes for erosion and irrigation, and pct. OM (Cols. 8-12, 14-17), it was assumed that all soils of an association were used for cropland. Corn yield estimates Class I-IV land (Col. 7) are based on cropland use but only for the more favorable soils. Productivity indexes (Col. 13) are a special case: here it is assumed that all soils are cultivated to the extent that they can be safely used without deterioration. [7]

Other Useful Summaries

Two tables include figures to facilitate use of the general soil maps.

Table A-2 shows the counties in which each of the 108 associations are found and the total percentage of Indiana area which each covers. It indicates the extent and importance of each association. Some occur in as many as 30 counties and others in as few as 1 county.

Table A-3 lists percentage by seven slope groups as indicating the smoothness or hilliness of an association and helps users form an idea of the nature of the topography.

A soil key is available to help users understand relationships of individual soil series to soil parent materials and natural drainage classes. It is organized to indicate soil similarities and differences. The closer two soil names occur under one drainage column in the key, the more nearly similar they are.

Effectiveness of CNI Sampling for Characterizing Indiana Soil Association

The 2 percent sample of CNI quarter

sections designed to estimate conservation needs for Indiana were well distributed and gave good coverage when applied to the larger associations. A number of composition estimates, made from published soil surveys, measured and compared entire acreages of soils with estimates from the 2 percent sample. These agreed very well for the larger associations. For a few small associations where CNI samples were limited, acreages of soils from detailed soil survey reports were calculated and used to adjust the acreage estimates made from CNI quarter section analyses.

Quarter sections tended to be better distributed in associations with generally circular or rectangular patterns in contrast to those with long, narrow patterns found along drainageways. For example, two of nine alluvial bottomland associations had less than 1 percent CNI samples (Table A-4). A long, narrow terrace area bordering major streams in south central Indiana and another dissected high terrace area bordering a major stream also had less than 1 percent sample.

Other small associations had limited sample, but of the total 108 only 10 had less than 1 percent CNI sample. Five of those ten occurred in counties with standard surveys, and estimates were made directly from detailed mapping. The other five were sent back to field soil scientists for their composition estimates. Often, one or more of the counties in which they occurred was a standard survey county where much was known about the soils, so estimates were easy to make.

Distribution and Size of Indiana's Soil Associations

The largest central Indiana association No. 64 (Crosby-Brookston) covers nearly 1.8 million acres, and Nos. 62 (Blount-Pweamo) and 86 (Morley-Blount) each cover nearly 1.5 million acres. The largest southern Indiana association No. 105 (Wellston-Zanesville-Berks) covers nearly 1.1 million acres. All in all, 13 associations larger than 500,000 acres cover 11,995,000 acres; the next 17, between 200,000 and 500,000 acres, total 5,568,000 acres (Table A-5). The 30 largest associations cover 76 percent of the state, and the remaining 78 comprise only 24 percent. Less than 1 percent of Indiana's land is in the smallest eight associations.

Table A-1. Percentage by Soil Series and by Natural Drainage Classes in Indiana Soil Associations. (Percent "Misc." includes a number of other soil series, each of limited extent. P-poorly drained, S-somewhat poorly drained, M-moderately well drained, and W-well drained. Estimated from soil mapping of sample areas done for 1958 USDA Conservation Needs Inventory.)

1 Eel-Martinsville-Genessee

Hoytville	4	P	
Milford	10	P	
Pewamo	2	P	
Misc.	1	P	17
Nappanee	10	S	
Whitaker	3	S	
Blount	5	S	
Misc.	1	S	19
Eel	32	M	
St. Clair	3	M	35
Genesee	7	W	
Ross	8	W	
Martinsville	7	W	
Morley	6	W	
Misc.	1	W	29

2 Genesee-Ross-Shoals

Sloan	2	P	
Mahalasville	5	P	7
Shoals	13	S	
Whitaker	4	S	
Misc.	1	S	18
Eel	37	M	37
Genesee	17	W	
Ross	5	W	
Fox	8	W	
Martinsville	7	W	
Misc.	1	W	38

3 Wakeland-Stendal-Haymond

Bonnie	3	P	
Misc.	2	P	5
Wakeland	9	S	
Stendal	39	S	
Avonburg	4	S	
Bartle	4	S	
Misc.	2	S	58
Wilbur	6	M	
Steff	9	M	
Misc.	1	M	16
Haymond	4	W	
Cuba	9	W	
Cincinnati	4	W	
Otwell	2	W	
Misc.	2	W	21

4 Genesee-Shoals-Eel

Shoals	15	S	15
Eel	10	M	10
Genesee	52	W	
Ross	3	W	
Fox	12	W	
Ockley	5	W	
Hennepin	3	W	75

5 Haymond-Nolin-Petrolia

Petrolia	17	P	
Misc.	1	P	18
Stendal	10	S	
Wakeland	5	S	15
Armiesburg	9	W	
Haymond	33	W	
Nolin	23	W	
Misc.	2	W	67

6 Genesee-Eel-Stendal-Pope

Shoals	13	S	
Stendal	40	S	
Vigo	5	S	58
Steff	6	M	
Ava	6	M	12
Genesee	6	W	
Pope	13	W	
Cincinnati	11	W	30

7 Huntington-Wheeling-Markham

Patton	2	P	2
Rahm	6	S	
Weinbach	6	S	12
Lindside	9	M	
Sciotoville	5	M	14
Huntington	15	W	
Wheeling	48	W	
Uniontown	5	W	
Markland	3	W	
Misc.	1	W	72

8 Huntington-Lindside

Stendal	8	S	
Newark	5	S	13
Lindside	25	M	
Sciotoville	4	M	
Misc.	1	M	30
Cuba	12	W	
Huntington	45	W	57

9 Haymond-Wakeland

Wakeland	8	S	
Stendal	6	S	
Bartle	8	S	22
Pekin	4	M	
Misc.	1	M	5
Huntington	5	W	
Haymond	22	W	
Cuba	12	W	
Elkinsville	5	W	
Wheeling	3	W	
Uniontown	6	W	
Crider	6	W	
Corydon	3	W	
Zanesville	3	W	
Wellston	3	W	
Muskingum	3	W	
Misc.	2	W	73

10 Alida-Delrey-Whitaker

Sloan	3	P	
Mucks	5	P	
Pewamo	2	P	10
Whitaker	25	S	
Alida	12	S	
DelRey	20	S	
Haskins	10	S	67
Eel	4	M	4
Morley	3	W	
Tracy	5	W	
Martinsville	8	W	
Oshtemo	3	W	19

11 Bono-Maumee-Warners

Maumee	22	P	
Mahalasville	6	P	
Toledo	14	P	
Bono	34	P	
Mucks	19	P	95
Plainfield	5	W	5

12 Chelsea-Hillsdale-Oshtemo

Maumee	10	P	
Rensselaer	5	P	
Washtenaw	3	P	18
Quinn	8	S	8
Chelsea	3	W	
Oshtemo	35	W	
Hillsdale	36	W	74

13 Conrad-Wooten-Weiss

Maumee	4	P	
Wooten	21	P	
Conrad	55	P	80
Weiss	17	S	17
Plainfield	3	W	3

14 Door-Tracy-Quinn

Rensselaer	12	P	
Mucks	7	P	19
Quinn	8	S	
Alida	5	S	13
Brems	3	M	3
Tyner	3	W	
Tracy	34	W	
Lydick	18	W	
Door	10	W	65

15 Door-Lydick

Rensselaer	6	P	
Troxel	3	P	9
Tracy	3	W	
Lydick	31	W	
Door	57	W	91

16 Elston-Wea

Westland	5	P	5
Ross	5	W	
Elston	46	W	
Wea	33	W	
Warsaw	11	W	95

17 Dubois-Otwell

Birds	4	P	
Robinson	17	P	21
Stendal	4	S	
Bartle	12	S	
Dubois	42	S	58
Steff	2	M	
Pekin	3	M	
Haubstadt	6	M	11
Otwell	6	W	
Crider	3	W	
Misc.	1	W	10

18 Fox-Martinsville-Aluvi

Sloan	2	P	
Sebewa	4	P	
Westland	8	P	
Mahalasville	8	P	
Misc.	1	P	23
Shoals	2	S	
Crosby	2	S	
Blount	4	S	
Misc.	1	S	9
Eel	11	M	11
Genesee	7	W	
Fox	30	W	
Martinsville	7	W	
Miami	6	W	
Morley	5	W	
Misc.	2	W	57

19 Fox-Nineveh-Ockley

Westland	13	P	
Misc.	1	P	14
Homer	2	S	
Sleeth	4	S	
Whitaker	3	S	9
Eel	6	M	6
Genesee	11	W	
Fox	31	W	
Nineveh	20	W	
Ockley	5	W	
Martinsville	3	W	
Misc.	1	W	71

20 Fox-Rodman

Westland	3	P	
Brookston	3	P	6
Whitaker	3	S	
Crosby	3	S	6
Fox	50	W	
Rodman	30	W	
Miami	8	W	88

21 Fulton-Rimer-Milford -Rensselaer

Milford	21	P	
Rensselaer	15	P	
Bono	15	P	
Toledo	10	P	
Mucks	5	P	66
Haskins	16	S	
Fulton	10	S	
Rimer	5	S	
Seward	3	S	34

Table A-1. Continued.

22 Homer-Sebewa-Gilford

Gilford	2	P	
Sebewa	22	P	
Westland	4	P	
Mussey	23	P	
Brookston	2	P	
Mucks	16	P	69
Homer	11	S	
Misc.	1	S	12
Oakville	6	W	
Fox	5	W	
Hillsdale	8	W	19

23 Maumee-Gilford-Rensselaer

Maumee	23	P	
Newton	5	P	
Gilford	17	P	
Rensselaer	20	P	
Mucks	7	P	72
Morocco	3	S	
Alida	4	S	
Misc.	1	S	8
Eel	3	M	
Brems	4	M	7
Plainfield	7	W	
Tracy	3	W	
Martinsville	2	W	
Misc.	1	W	13

24 Maumee-Newton

Newton	9	P	
Maumee	48	P	
Gilford	6	P	
Mucks	5	P	
Misc.	1	P	69
Morocco	9	S	9
Brems	6	M	
Misc.	1	M	7
Plainfield	12	W	
Martinsville	3	W	15

26 Martinsville-Belmore-Fox

Rensselaer	10	P	10
Whitaker	10	S	10
Martinsville	40	W	
Belmore	20	W	
Fox	15	W	
Chelsea	5	W	80

27 Martinsville-Whitaker

Shoals	7	S	
Wakeland	3	S	
Stendal	6	S	
Whitaker	14	S	
Henshaw	5	S	35
Martinsville	50	W	
Princeton	3	W	
Uniontown	12	W	65

28 Mahalasville-Whitaker

Mahalasville	75	P	75
Whitaker	17	S	
Crosby	1	S	18
Martinsville	6	W	
Misc.	1	W	7

30 Milford-Montgomery-Rensselaer

Montgomery	5	P	
Milford	53	P	
Rensselaer	22	P	80
Delrey	7	S	
Whitaker	4	S	
Blount	2	S	
Misc.	1	S	14
Lucas	2	W	
Martinsville	3	W	
Misc.	1	W	6

31 McGary

Patton	11	P	
Montgomery	8	P	
Zipp	7	P	26
Stendal	4	S	
Henshaw	7	S	
McGary	19	S	
Misc.	2	S	32
Steff	10	M	
Misc.	1	M	11
Haymond	3	W	
Wheeling	3	W	
Uniontown	5	W	
Markland	16	W	
Zanesville	4	W	31

32 Negley-Parke

Wakeland	11	S	
Avonburg	3	S	14
Steff	4	M	
Rossmoyne	9	M	13
Cuba	2	W	
Parke	20	W	
Cincinnati	7	W	
Hickory	4	W	
Crider	7	W	
Berks	8	W	
Pike	6	W	
Negley	18	W	
Misc.	1	W	73

33 Oshtemo-Bronson

Maumee	10	P	
Newton	10	P	
Mucks	5	P	25
Brady	5	S	5
Bronson	20	M	20
Oshtemo	50	W	50

34 Oakville-Plainfield-Tawas

Maumee	5	P	
Adrian	27	P	32
Oakville	68	W	68

35 Oshtemo-Fox

Gilford	4	P	
Westland	4	P	
Mucks	8	P	
Misc.	1	P	17
Shoals	3	S	
Crosier	5	S	
Misc.	2	S	10
Misc.	1	M	1
Oshtemo	22	W	
Plainfield	6	W	
Ockley	5	W	
Fox	24	W	
Miami	10	W	
Morley	4	W	
Misc.	1	W	72

36 Ockley-Westland

Sebewa	9	P	
Westland	7	P	
Brookston	5	P	21
Sleeth	10	S	
Darroch	3	S	
Fincastle	5	S	18
Misc.	1	M	1
Genesee	7	W	
Fox	20	W	
Ockley	20	W	
Miami	9	W	
Hennepin	3	W	
Misc.	1	W	60

37 Ockley-Wea

Westland	25	P	
Pewamo	18	P	
Misc.	1	P	44
Elliott	12	S	
Crane	5	S	17
Huntsville	3	W	
Wea	35	W	
Misc.	1	W	39

38 Ockley-Fox

Sebewa	4	P	
Westland	8	P	
Mahalasville	4	P	16
Shoals	4	S	
Sleeth	4	S	
Crosby	6	S	
Misc.	1	S	15
Misc.	1	M	1
Genesee	7	W	
Fox	35	W	
Ockley	10	W	
Rodman	3	W	
Martinsville	8	W	
Miami	3	W	
Hennepin	2	W	68

39 Plainfield-Brems-Morrocco

Maumee	21	P	
Newton	5	P	
Gilford	10	P	
Saugatuck	11	P	
Mucks	5	P	
Misc.	2	P	54
Morocco	11	S	11
Brems	6	M	6
Plainfield	19	W	
Chelsea	6	W	
Fox	3	W	
Misc.	1	W	29

40 Plainfield-Tyner-Oshtemo

Newton	8	P	
Maumee	5	P	
Rensselaer	4	P	
Mucks	10	P	
Misc.	2	P	29
Morocco	5	S	
Quinn	4	S	9
Plainfield	14	W	
Chelsea	5	W	
Tyner	8	W	
Tracy	5	W	
Oshtemo	27	W	
Hillsdale	3	W	62

41 Plainfield-Watseka

Maumee	10	P	
Mucks	5	P	15
Watseka	40	S	40
Plainfield	45	W	45

42 Plainfield-Chelsea

Newton	6	P	
Maumee	9	P	
Gilford	3	P	
Rensselaer	3	P	
Mucks	5	P	26
Shoals	2	S	
Morocco	5	S	
Homer	3	S	10
Brems	7	M	7
Plainfield	22	W	
Tyner	8	W	
Chelsea	12	W	
Oshtemo	9	W	
Fox	6	W	57

43 Patton-Henshaw

Patton	42	P	
Zipp	6	P	48
Shoals	11	S	
Wakeland	8	S	
Algier	7	S	
Henshaw	14	S	40
Genesee	2	W	
Uniontown	10	W	12

44 Patton-Lyles-Henshaw

Patton	31	P	
Lyles	25	P	
Kings	3	P	
Rensselaer	3	P	
Ragsdale	3	P	65
Henshaw	13	S	
Wakeland	8	S	21
Wilbur	6	M	6
Genesee	4	W	
Markland	4	W	8

45 Peoga-Bartle-Hosmer

Peoga	36	P	36
Bartle	30	S	
Wakeland	3	S	33
Hosmer	23	W	
Hickory	8	W	31

Table A-1. Continued.

46 Parke-Miami-Negley

Shoals	3	S	
Whitaker	2	S	
Crosby	10	S	15
Princeton	3	W	
Martinsville	2	W	
Miami	30	W	
Parke	25	W	
Negley	25	W	85

47 Rensselaer-Montgomery

Maumee	17	P	
Rensselaer	23	P	
Montgomery	18	P	58
Darroch	14	S	
Strole	23	S	37
Foresman	5	M	5

48 Rensselaer-Darroch

Rensselaer	29	P	
Sebewa	5	P	
Montgomery	6	P	40
Darroch	17	S	
Odell	6	S	
Strole	4	S	27
Eel	3	M	
Foresman	14	M	17
Sparta	2	W	
Martinsville	5	W	
Jasper	9	W	16

49 Rensselaer-Whitaker

Milford	8	P	
Rensselaer	24	P	
Sebewa	12	P	
Misc.	1	P	45
Crosby	5	S	
Whitaker	28	S	33
Eel	4	M	4
Miami	5	W	
Martinsville	13	W	18

50 Vincennes-Zipp-Ross

Sloan	20	P	
Birds	5	P	
Vincennes	11	P	
Westland	5	P	
Zipp	7	P	
Misc.	1	P	49
Stendal	4	S	
Bartle	6	S	
Homer	4	S	
Misc.	1	S	15
Misc.	1	M	1
Ross	16	W	
Elkinsville	5	W	
Fox	6	W	
Elston	3	W	
Alford	5	W	35

51 Volinia-Dickinson

Misc.	1	P	
Rensselaer	4	P	5
Crosier	2	S	2
Volinia	42	W	
Tracy	8	W	
Dowagiac	23	W	
Warsaw	10	W	
Dickinson	10	W	93

53 Wea-Crane

Westland	23	P	23
Crane	37	S	37
Tippecanoe	9	M	
Misc.	1	M	10
Wea	30	W	30

54 Warsaw-Elston-Fox

Sebewa	12	P	12
Sleeth	2	S	
Misc.	1	S	3
Genesee	3	W	
Elston	6	W	
Fox	28	W	
Warsaw	45	W	
Russell	2	W	
Misc.	1	W	85

55 Westland-Sleeth

Sebewa	10	P	
Westland	29	P	
Mucks	2	P	
Misc.	1	P	42
Homer	3	S	
Sleeth	10	S	
Whitaker	5	S	18
Fox	24	W	
Ockley	12	W	
Martinsville	4	W	40

56 Weinbach-Sciotoville

Ginat	5	P	5
Shoals	2	S	
Newark	2	S	
Weinbach	43	S	47
Sciotoville	8	M	8
Wheeling	40	W	40

57 Weinbach-Wheeling

Ginat	17	P	17
Weinbach	41	S	
Stendal	7	S	48
Sciotoville	16	M	
Muren	2	M	18
Wheeling	17	W	17

58 Crosier-Brookston

Gilford	4	P	
Westland	2	P	
Brookston	28	P	
Misc.	1	P	35
Crosier	38	S	38
Celina	7	M	
Misc.	1	M	8
Hillsdale	5	W	
Miami	8	W	
Riddles	5	W	
Misc.	1	W	19

59 Brookston-Odell-Corwin

Brookston	49	P	
Kokomo	3	P	52
Odell	28	S	28
Corwin	18	M	
Misc.	1	M	19
Misc.	1	W	1

61 Blount-Morley-Pewamo

Washtenaw	3	P	
Pewamo	11	P	
Mucks	7	P	
Misc.	1	P	22
Blount	14	S	
Elliott	3	S	
Misc.	3	S	20
Misc.	2	M	2
Chelsea	3	W	
Hillsdale	4	W	
Miami	3	W	
Morley	41	W	
Riddles	5	W	56

62 Blount-Pewamo

Pewamo	38	P	
Misc.	2	P	40
Blount	48	S	48
Misc.	1	M	1
Morley	11	W	11

63 Riddles-Miami-Crosby

Brookston	19	P	
Misc.	2	P	21
Homer	2	S	
Crosier	21	S	
Blount	10	S	
Haskins	3	S	
Misc.	3	S	39
Misc.	1	M	1
Miami	26	W	
Riddles	12	W	
Misc.	1	W	39

64 Crosby-Brookston

Mahalasville	2	P	
Brookston	38	P	
Misc.	1	P	41
Crosby	45	S	45
Celina	5	M	
Misc.	1	M	6
Miami	7	W	
Misc.	1	W	8

65 Elliott-Markham-Pewamo

Pewamo	16	P	
Lenawee	3	P	
Misc.	2	P	21
Alida	2	S	
Elliott	24	S	26
Lydick	2	W	
Markham	36	W	
Morley	15	W	53

66 Fincastle-Ragsdale

Ragsdale	31	P	31
Fincastle	50	S	50
Celina	5	M	
Xenia	3	M	8
Genesee	2	W	
Miami	6	W	
Russell	3	W	11

67 Hoytsville-Nappanee

Hoytville	68	P	
Pewamo	4	P	72
Nappanee	15	S	
Blount	4	S	
Whitaker	3	S	
Crosby	3	S	25
St. Clair	3	W	3

69 Parr-Miami

Maumee	8	P	
Gilford	3	P	
Brookston	26	P	
Mucks	4	P	41
Crosby	3	S	
Odell	10	S	13
Celina	3	M	
Corwin	6	M	9
Plainfield	6	W	
Chelsea	4	W	
Jasper	5	W	
Ayr	5	W	
Parr	14	W	
Owosso	3	W	37

70 Parr-Corwin

Brookston	33	P	33
Odell	6	S	6
Eel	3	M	
Corwin	14	M	17
Miami	11	W	
Parr	19	W	
Fox	14	W	44

71 Randolph-Hillsdale

Rensselaer	30	P	
Granby	20	P	50
Darroch	25	S	25
Brems	10	M	
Jasper	5	M	15
Chelsea	10	W	10

72 Reesville-Ragsdale

Westland	5	P	
Ragsdale	20	P	25
Wakeland	2	S	
Vigo	5	S	
Fincastle	12	S	
Reesville	35	S	
Iva	9	S	63
Misc.	1	M	1
Russell	3	W	
Alford	6	W	
Misc.	2	W	11

73 Raub-Ragsdale

Ragsdale	44	P	
Kokomo	8	P	52
Raub	26	S	26
Dana	12	M	12
Sidell	9	W	
Misc.	1	W	10

74 Ragsdale-Sidell

Westland	13	P	
Ragsdale	20	P	33
Reesville	4	S	
Raub	8	S	
Flanagan	15	S	27
Warsaw	6	W	
Parr	11	W	
Sidell	12	W	
Mellott	11	W	40

Table A-1. Continued.

76 Russell-Hennepin

Misc.	2	P	2
Reesville	11	S	
Fincastle	14	S	
Misc.	1	S	26
Eel	4	M	4
Genesee	4	W	
Sylvan	6	W	
Rodman	2	W	
Ockley	4	W	
Russell	33	W	
Hennepin	18	W	
Misc.	1	W	68

77 Russell-Xenia

Brookston	2	P	2
Fincastle	18	S	18
Eel	6	M	
Xenia	15	M	
Genesee	4	M	25
Miami	31	W	
Russell	12	W	
Hennepin	7	W	
Alford	4	W	
Misc.	1	W	55

78 Miami-Metea-Celina

Gilford	9	P	
Sebewa	7	P	
Brookston	16	P	
Mucks	2	P	
Misc.	1	P	35
Crosier	9	S	
Misc.	1	S	10
Eel	4	M	
Celina	7	M	11
Chelsea	7	W	
Oshtemo	3	W	
Hillsdale	10	W	
Metea	6	W	
Miami	17	W	
Misc.	1	W	44

79 Miami-Ososso-Riddles

Gilford	3	P	
Brookston	12	P	
Mucks	5	P	20
Crosby	11	S	11
Chelsea	7	W	
Owosso	11	W	
Miami	17	W	
Riddles	33	W	
Misc.	1	W	69

80 Miami-Crosby-Metea

Sebewa	3	P	
Brookston	14	P	
Mucks	9	P	
Misc.	1	P	27
Crosier	11	S	11
Chelsea	3	W	
Fox	4	W	
Metea	9	W	
Miami	46	W	62

81 Miami-Russell-Fincastle

Brookston	11	P	
Misc.	1	P	12
Crosby	5	S	
Fincastle	12	S	
Misc.	1	S	18
Eel	5	M	
Xenia	6	M	11
Fox	4	W	
Miami	37	W	
Russell	13	W	
Hennepin	4	W	
Misc.	1	W	59

82 Miami-Fox-Milton

Brookston	30	P	30
Whitaker	15	S	
Crosier	10	S	25
Martinsville	30	W	
Miami	15	W	45

83 Miami-Crosby

Brookston	12	P	
Misc.	2	P	14
Crosby	27	S	
Misc.	1	S	28
Eel	4	M	
Celina	9	M	13
Genesee	3	W	
Fox	3	W	
Miami	37	W	
Hennepin	2	W	45

84 Miami-Hennepin

Brookston	3	P	
Misc.	1	P	4
Crosby	23	S	23
Eel	4	M	
Celina	10	M	14
Genesee	4	W	
Fox	4	W	
Miami	39	W	
Hennepin	11	W	
Misc.	1	W	59

85 Miami-Fox-Martinsville

Westland	8	P	
Mahalasville	10	P	
Brookston	5	P	
Mucks	4	P	27
Crosby	7	S	
Whitaker	3	S	10
Eel	5	M	
Celina	3	M	8
Fox	10	W	
Martinsville	7	W	
Miami	37	W	
Misc.	1	W	55

86 Morley-Blount

Pewamo	12	P	
Mahalasville	3	P	
Mucks	3	P	
Misc.	1	P	19
Blount	25	S	
Misc.	1	S	26
Eel	4	M	4
St. Clair	3	W	
Miami	9	W	
Morley	37	W	
Misc.	2	W	51

87 Muskingum-Shadeland-Highgap

Westland	4	P	4
Eel	4	M	4
Genesee	4	W	
Fox	9	W	
Rodman	2	W	
Hennepin	3	W	
Muskingum	29	W	
Shadeland	23	W	
Highgap	22	W	92

88 Odell-Chalmers

Brookston	47	P	47
Crosby	3	S	
Odell	21	S	24
Corwin	16	M	
Misc.	1	M	17
Parr	12	W	12

89 Sidell-Parr

Brookston	39	P	39
Odell	9	S	9
Corwin	5	M	5
Fox	6	W	
Miami	5	W	
Parr	36	W	47

90 Hennepin-Rodman

Shoals	2	S	
Crosby	6	S	8
Celina	6	M	6
Genesee	7	W	
Miami	42	W	
Hennepin	18	W	
Rodman	18	W	
Misc.	1	W	86

91 Avonburg-Clermont

Clermont	39	P	
Misc.	1	P	40
Stendal	2	S	
Avonburg	43	S	45
Rossmoyne	7	M	
Jennings	3	M	
Misc.	1	M	11
Cincinnati	4	W	4

92 Cincinnati-Hickory

Iva	3	S	
Vigo	21	S	
Stendal	5	S	29
Ava	9	M	
Misc.	1	M	10
Cuba	6	W	
Alford	4	W	
Cincinnati	37	W	
Hickory	14	W	61

93 Cincinnati-Rossmoyne-Hickory

Stendal	4	S	
Avonburg	5	S	9
Rossmoyne	19	M	
Jennings	10	M	29
Haymond	2	W	
Cincinnati	37	W	
Grayford	9	W	
Switzerland	4	W	
Hickory	6	W	
Fairmount	3	W	
Misc.	1	W	62

95 Cincinnati-Ava

Bartle	3	S	
Vigo	17	S	20
Ava	14	M	14
Cuba	4	W	
Pike	3	W	
Cincinnati	41	W	
Hickory	5	W	
Crider	4	W	
Zanesville	3	W	
Berks	4	W	
Corydon	2	W	66

96 Cincinnati-Ava-Alford

Stendal	6	S	
Iva	3	S	
Vigo	13	S	22
Steff	4	M	
Muren	5	M	
Ava	18	M	27
Alford	6	W	
Cincinnati	42	W	
Hickory	3	W	51

98 Crider-Hagerstown-Frederick

Lawrence	2	S	
Misc.	1	S	3
Bedford	6	M	
Misc.	2	M	8
Haymond	4	W	
Grayford	4	W	
Hagerstown	4	W	
Crider	55	W	
Frederick	11	W	
Corydon	4	W	
Wellston	2	W	
Berks	3	W	
Misc.	2	W	89

99 Crider-Frederick

Misc.	1	S	1
Misc.	1	M	1
Haymond	5	W	
Crider	63	W	
Frederick	24	W	
Corydon	6	W	98

100 Corydon-Weikert-Berks

Johnsburg	3	S	3
Misc.	1	M	1
Haymond	5	W	
Cincinnati	6	W	
Crider	10	W	
Frederick	6	W	
Corydon	27	W	
Zanesville	8	W	
Wellston	6	W	
Muskingum	5	W	
Berks	10	W	
Weikert	13	W	96

101 Fairmount-Switzerland

Misc.	1	M	1
Huntington	3	W	
Cincinnati	4	W	
Switzerland	18	W	
Fairmount	68	W	
Corydon	5	W	
Misc.	1	W	99

102 Grayford

Stendal	4	S	
Vigo	7	S	
Avonburg	8	S	
Misc.	1	S	20

Table A-1. Continued.

102 (continued)			
Rossmoyne	3	M	3
Cincinnati	13	W	
Grayford	62	W	
Corydon	2	W	77
103 Lawrence-Bedford-Crider			
Lawrence	23	S	
Misc.	1	S	24
Bedford	23	M	23
Haymond	4	W	
Cincinnati	3	W	
Crider	25	W	
Frederick	6	W	
Corydon	3	W	
Zanesville	6	W	
Muskimgum	4	W	
Misc.	2	W	53
104 Tilsit-Johnsburg			
Johnsburg	35	S	35
Tilsit	50	M	50
Zanesville	8	W	
Wellston	7	W	15
105 Wellston-Zanesville-Berks			
Stendal	3	S	
Misc.	1	S	4
Tilsit	4	M	4
Haymond	3	W	
Zanesville	26	W	
Wellston	27	W	
Muskimgum	10	W	
Gilpin	10	W	
Berks	14	W	
Misc.	2	W	92
106 Berks-Gilpin-Weikert			
Rossmoyne	2	M	
Misc.	1	M	3
Cuba	2	W	
Cincinnati	8	W	
Crider	2	W	
Zanesville	12	W	
Wellston	7	W	
Gilpin	13	W	
Muskimgum	8	W	
Weikert	12	W	
Berks	29	W	
Rarden	2	W	
Misc.	2	W	97
107 Zanesville-Wellston			
Wakeland	4	S	
Johnsburg	2	S	6
Steff	2	M	
Tilsit	11	M	13
Zanesville	45	W	
Wellston	18	W	
Muskingum	10	W	
Gilpin	4	W	
Berks	4	W	81
108 Mucks-Peats			
Houghton	52	P	
Adrian	12	P	
Toledo	6	P	
Maumee	8	P	
Rensselaer	5	P	
Misc.	1	P	84
Morocco	2	S	
Whitaker	3	S	
Misc.	1	S	6
Metea	3	W	
Martinsville	5	W	
Plainfield	2	W	10
109 Alford			
Ragsdale	3	P	3
Wakeland	7	S	
Iva	5	S	
Misc.	1	S	13
Wilbur	7	M	
Iona	3	M	
Muren	3	M	
Misc.	1	M	14
Haymond	2	W	
Princeton	2	W	
Sylvan	4	W	
Alford	54	W	
Pike	4	W	
Hosmer	4	W	70
110 Bloomfield-Princeton-Ayrshire			
Lyles	8	P	
Ragsdale	2	P	
Misc.	1	P	11
Wakeland	2	S	
Ayrshire	11	S	
Iva	9	S	22
Iona	5	M	
Muren	6	M	11
Ross	4	W	
Bloomfield	17	W	
Princeton	15	W	
Sylvan	7	W	
Alford	5	W	
Crider	2	W	
Muskingum	3	W	
Misc.	3	W	56
111 Hosmer			
Ragsdale	2	P	2
Stendal	7	S	
Iva	5	S	
Misc.	1	S	13
Steff	2	M	2
Hosmer	64	W	
Alford	10	W	
Cincinnati	3	W	
Zanesville	4	W	
Wellston	2	W	83
112 Iva-Ava			
Stendal	3	S	
Iva	60	S	
Corydon	10	S	
Vigo	16	S	89
Ava	8	M	8
Cincinnati	3	W	3
113 Hosmer-Cincinnati-Iva			
Stendal	9	S	
Vigo	8	S	
Iva	14	S	31
Cincinnati	22	W	
Hosmer	39	W	
Hickory	8	W	69
114 Lyles-Ayrshire-Princeton			
Lyles	43	P	
Kings	4	P	
Vincennes	4	P	51
Ayrshire	34	S	34
Princeton	11	W	
Bloomfield	4	W	15
115 Princeton-Ayrshire-Bloomfield			
Rensselaer	5	P	5
Wakeland	5	S	
Ayrshire	20	S	
Iva	5	S	
Reesville	5	S	35
Muren	5	M	5
Princeton	25	W	
Alford	10	W	
Miami	5	W	
Bloomfield	10	W	
Hickory	5	W	55
116 Princeton-Fox			
Rensselaer	3	P	3
Fincastle	4	S	
Ayrshire	3	S	7
Genesee	7	W	
Cincinnati	8	W	
Fox	4	W	
Ockley	6	W	
Pike	11	W	
Russell	11	W	
Chelsea	6	W	
Princeton	37	W	90

Table A-2. Location by Counties and Percent of State Occupied by Each Association.

Association	Counties
1 (0.16%)	Adams, Allen, Dekalb, Huntington, Wells, Whitley
2 (0.51%)	Bartholomew, Jackson, Johnson, Shelby, Washington
3 (2.53%)	Bartholomew, Brown, Clark, Daviess, Decatur, Dubois, Franklin, Gibson, Greene, Jackson, Jefferson, Jennings, Knox, Lawrence, Martin, Monroe, Morgan, Pike, Posey, Ripley, Scott, Spencer, Sullivan, Vanderburgh, Warrick, Washington
4 (2.44%)	Bartholomew, Boone, Carroll, Cass, Clay, Clinton, Dearborn, Decatur, Fayette, Fountain, Franklin, Hamilton, Hendricks, Howard, Jennings, Johnson, Marion, Montgomery, Morgan, Newton, Ohio, Parke, Putnam, Ripley, Tippecanoe, Union, Vermillion, Vigo, Warren, Wayne
5 (1.25%)	Clay, Daviess, Dubois, Gibson, Greene, Knox, Lawrence, Martin, Owen, Pike, Posey, Vigo, Washington
6 (0.19%)	Monroe, Owen
7 (0.42%)	Clark, Crawford, Dearborn, Floyd, Harrison, Jefferson, Ohio, Perry, Switzerland
8 (0.19%)	Posey, Spencer, Vanderburgh, Warrick
9 (0.59%)	Crawford, Harrison, Jackson, Knox, Lawrence, Martin, Orange, Perry, Spencer, Washington
10 (0.26%)	Lake, LaPorte, Porter
11 (0.13%)	Lake, Laporte, Porter
12 (0.06%)	Laporte, Porter, St. Joseph
13 (0.04%)	Newton
14 (0.62%)	Laporte, Porter
15 (0.24%)	Laporte
16 (0.09%)	Tippecanoe
17 (0.30%)	Bartholomew, Jackson, Monroe, Morgan, Owen, Putnam
18 (1.57%)	Adams, Allen, Blackford, Cass, Dekalb, Delaware, Grant, Hancock, Henry, Howard, Huntington, Jay, Kociusko, Madison, Miami, Noble, Randolph, Rush, Steuben, Vigo, Wabash, Wells, Whitley
19 (0.70%)	Bartholomew, Decatur, Fayette, Franklin, Johnson, Shelby, Switzerland, Union, Wayne
20 (0.01%)	Shelby
21 (0.03%)	Dekalb, Noble, Steuben
22 (0.20%)	Elkhart, Kosciusko, Lagrange, Noble
23 (2.88%)	Fulton, Jasper, Lake, Laporte, Newton, Porter, Pulaski, St. Joseph, Starke, White
24 (0.78%)	Jasper, Newton
25 (0.04%)	Allen
27 (0.18%)	Bartholomew, Jackson, Marshall
28 (0.11%)	Boone, Madison, Morgan, Tipton
30 (0.08%)	Allen, Wells
31 (0.31%)	Gibson, Perry, Pike, Spencer, Vanderburgh, Warrick, Washington
32 (0.18%)	Jackson, Morgan, Owen, Putnam
33 (0.03%)	Pulaski
34 (0.20%)	Lake, Laporte, Porter
35 (2.00%)	Elkhart, Fulton, Kosciusko, Lagrange, Marshall, Miami, Noble, St. Joseph, Steuben, Wabash, White, Whitley
36 (1.07%)	Carroll, Cass, Fountain, Hamilton, Miami, Montgomery, Rush, Tippecanoe, White
37 (0.08%)	Benton
38 (0.45%)	Boone, Fountain, Hamilton, Hendricks, Johnson, Marion, Miami, Morgan, Parke, Tippecanoe, Warren

Table A-2. Continued.

Association	Counties
39 (0.78%)	Cass Jasper Laporte Newton Porter Starke White
40 (0.55%)	Laporte Marshall St. Joseph Starke
41 (0.14%)	Lake Porter
42 (0.56%)	Elkhart Fulton Lagrange Marshall Pulaski St. Joseph Starke Steuben White
43 (0.13%)	Morgan Posey Vanderburgh
44 (0.38%)	Greene Knox Sullivan
45 (0.43%)	**Daviess** **Dubois** **Gibson** **Jackson** **Martin** **Pike**
46 (0.01%)	Shelby
47 (0.09%)	Jasper Pulaski
48 (0.69%)	Benton Jasper Newton Warren
49 (0.20%)	Allen Bartholomew Hendricks Johnson Kosciusko Marshall
50 (0.55%)	Gibson Knox Pike Posey
57 (0.22%)	Elkhart Kosciusko Laporte St. Joseph
53 (0.10%)	Fountain
54 (0.55%)	Knox Lagrange Noble Parke Steuben Sullivan Vermillion Vigo Warren
55 (0.09%)	Johnson Shelby
56 (0.24%)	Posey Vanderburgh Warrick
57 (0.20%)	Spencer
58 (1.32%)	Cass Elkhart Fulton Kosciusko Marshall Pulaski St. Joseph White
59 (0.07%)	Jasper Pulaski
61 (1.09%)	Lake Laporte Porter St. Joseph
62 (6.26%)	Adams Allen Blackford Dekalb Delaware Elkhart Grant
	Howard Huntington Jay Lagrange Madison Miami Noble Randolph Wabash Wells Whitley
63 (2.65%)	Dekalb Elkhart Fulton Kosciusko Lagrange Marshall Noble St. Joseph Steuben
64 (7.69%)	Bartholomew Boone Carroll Clinton Decatur Delaware Fayette Grant Hamilton Hancock Hendricks Henry Howard Johnson Madison Marion Morgan Randolph Rush Shelby Tippecanoe Tipton Wayne White
65 (0.43%)	Lake Porter
66 (3.37%)	Bartholomew Boone Carroll Cass Clinton
	Decatur Fayette Franklin Hendricks Howard Jennings Miami Montgomery Parke Putnam Rush Tippecanoe Union Vermillion Vigo Warren Wayne
67 (0.38%)	Allen
69 (0.37%)	Jasper Newton
70 (0.29%)	Benton White
71 (0.07%)	Wells White
72 (1.13%)	Daviess Fayette Fountain Gibson Knox Montgomery Parke Posey Sullivan Vanderburgh Vigo
73 (0.69%)	Clinton Montgomery Tippecanoe Vermillion Warren
74 (0.11%)	Fountain Montgomery
75 (0.48%)	Fountain Montgomery Parke Putnam
77 (0.63)	Montgomery Parke Putnam Vermillion Vigo
78 (0.54%)	Benton Cass Fulton Pulaski White
79 (0.55%)	Fulton Marshall Starke
80 (0.15%)	Cass Fulton Miami
81 (3.88%)	Bartholomew Benton Carroll Cass Clinton Decatur Fayette Franklin Hamilton Hendricks Howard Jennings Johnson Miami Montgomery Morgan Parke Putnam Rush Tippecanoe Union Vermillion Warren Wayne
82 (0.02%)	White

Table A-2. Continued.

Association	Counties
83 (2.86%)	Bartholomew Boone Clinton Fayette Hamilton Hancock Hendricks Henry Johnson Marion Montgomery Morgan Randolph Rush Shelby Tippecanoe Tipton Wayne
84 (1.44%)	Bartholomew Decatur Hamilton Johnson Marion Morgan Putnam Shelby Tippecanoe Vermillion Warren Wayne
85 (0.27%)	Delaware Madison
86 (6.31%)	Adams Allen Blackford Cass Dekalb Delaware Fulton Grant Huntington Jay Kosciusko Madison Miami Noble Randolph Steuben Wabash Wells Whitley
87 (0.03%)	Fountain
88 (1.73%)	Benton Jasper Montgomery Newton Tippecanoe Warren White
89 (0.49%)	Benton Montgomery Tippecanoe Warren
90 (0.13%)	Montgomery Tippecanoe
91 (1.51%)	Bartholomew Clark Dearborn Decatur Franklin Jackson Jefferson Jennings Ohio Ripley Scott Switzerland
92 (1.09%)	Brown Clay Johnson Owen Parke Putnam Sullivan Vigo
93 (3.80%)	Bartholomew Clark Dearborn Decatur Fayette Floyd Franklin Jackson Jefferson Jennings Ohio Ripley Scott Switzerland Washington
95 (0.72%)	Brown Clay Greene Monroe Morgan Owen Putnam
96 (1.02%)	Clay Greene Putnam Sullivan
98 (2.48%)	Clark Crawford Floyd Greene Harrison Jackson Lawrence Monroe Morgan Orange Owen Washington
99 (0.54%)	Harrison Lawrence Orange Washington
100 (0.61%)	Harrison Lawrence Monroe
101 (1.22%)	Clark Dearborn Franklin Jefferson Ohio Ripley Switzerland
102 (0.19%)	Jefferson Monroe Morgan Owen
103 (0.29%)	Harrison Lawrence Orange Washington
104 (0.07%)	Crawford
105 (4.68%)	Brown Crawford Daviess Dubois Greene Harrison Jackson Lawrence Martin Monroe Orange Owen Perry Washington
106 (2.10%)	Bartholomew Brown Clark Floyd Jackson Johnson Lawrence Monroe Morgan Scott Washington
107 (1.60%)	Dubois Gibson Perry Pike Spencer Vanderburgh Warrick
108 (0.63%)	Adams Allen Blackford Dekalb Delaware Elkhart Henry Jasper Kosciusko Lagrange Laporte Madison Marshall Montgomery Newton Noble Porter Pulaski St. Joseph Starke Steuben Warren Whitley
109 (1.66%)	Daviess Gibson Knox Pike Posey Spencer Vanderburgh Warrick
110 (0.74%)	Clay Daviess Gibson Greene Jackson Knox Lawrence Martin Monroe Pike Posey Sullivan Washington
111 (1.17%)	Dubois Gibson Greene Knox Pike Posey Spencer Vanderburgh Warrick
112 (0.64%)	Clay Greene Parke Putnam Sullivan Vigo
113 (0.36%)	Daviess Martin
114 (0.16)	Daviess Greene
115 (0.18)	Bartholomew Vigo
116 (0.06%)	Johnson Morgan Parke

Table A-3. Percentage of Slope Classes in Indiana Soil Associations.

1	A = 85; B = 10; C = 4; >C = 1
2	A = 92; B = 5; C = 2; >C = 1
3	A = 90; B = 2; C = 4; D = 2; >D = 2
4	A = 90; B = 4; C = 2; >C = 4
5	A = 98; B = 0; C = 2
6	A = 83; B = 7; C = 4; D = 3; E = 2; >E = 1
7	A = 69; B = 18; C = 8; D = 3; E = 1; >E = 1
8	A = 97; B = 3
9	A = 63; B = 11; C = 12; D = 6; E = 3; F = 4; G = 1
10	A = 82; B = 14; C = 3; >C = 1
11	A = 96; B = 3; C = 1
12	A = 56; B = 30; C = 10; D = 3; >D = 1
13	A = 97; B = 2; >B = 1
14	A = 61; B = 28; C = 10; D = 1
15	A = 67; B = 31; C = 2
16	A = 90; B = 7; C = 3
17	A = 74; B = 17; C = 5; D = 2; >D = 2
18	A = 70; B = 18; C = 9; D = 2; E = 1
19	A = 78; B = 15; C = 5; D = 1; >D = 1
20	A = 39; B = 21; C = 9; D = 19; E = 2; F = 7; G = 3
21	A = 94; B = 6
22	A = 86; B = 9; C = 3; D = 2
23	A = 90; B = 6; C = 4
24	A = 87; B = 9; C = 3; >C = 1
26	A = 61; B = 32; C = 5; >C = 2
27	A = 66; B = 23; C = 7; D = 1; E = 0; F = 2; G = 1
28	A = 96; B = 3; C = 1
30	A = 94; B = 4; C = 1; >C = 1
31	A = 73; B = 13; C = 8; D = 4; E = 1; >E = 1
32	A = 22; B = 17; C = 12; D = 9; E = 10; F = 18; G = 12
33	A = 78; B = 17; C = 4; D = 1
34	A = 42; B = 39; C = 10; D = 9
35	A = 58; B = 27; C = 11; D = 3; E = 1
36	A = 70; B = 17; C = 7; D = 2; E = 1; F = 1; G = 2
37	A = 98; B = 1; C = 1
38	A = 68; B = 18; C = 6; D = 3; E = 1; F = 2; G = 2
39	A = 76; B = 15; C = 7; D = 2
40	A = 64; B = 24; C = 9; D = 3
41	A = 62; B = 25; C = 11; D = 2
42	A = 60; B = 26; C = 10; D = 3; >D = 1
43	A = 90; B = 5; C = 4; >C = 1
44	A = 96; B = 2; >B = 2
45	A = 66; B = 16; C = 6; D = 3; E = 2; F = 3; G = 4
46	A = 18; B = 27; C = 14; D = 7; E = 7; F = 13 G = 14
47	A = 100
48	A = 94; B = 4; C = 1; >C = 1
49	A = 89; B = 8; C = 2; >C = 1
50	A = 85; B = 5; C = 6; D = 3; >D = 1
51	A = 87; B = 8; C = 4; >C = 1
53	A = 97; B = 3
54	A = 66; B = 17; C = 13; D = 2; E = 2
55	A = 83; B = 11; C = 4; D = 1; >D = 1
56	A = 79; B = 15; C = 3; D = 2; >D = 1
57	A = 84; B = 13; C = 2; >D = 1
58	A = 74; B = 19; C = 5; D = 1; >D = 1
59	A = 95; B = 4; C = 1
61	A = 42; B = 38; C = 15; D = 3; >D = 2
62	A = 76; B = 20; C = 3; >C = 1
63	A = 59; B = 27; C = 10; D = 3; >D = 1
64	A = 84; B = 12; C = 3; >C = 1
65	A = 53; B = 40; C = 5; D = 1; >D = 1
66	A = 80; B = 16; C = 3; >C = 1
67	A = 94; B = 5; >B = 1
69	A = 72; B = 22; C = 5; D = 1
70	A = 65; B = 26; C = 7; D = 1; >D = 1
71	A = 89; B = 7; C = 3; D = 1
72	A = 76; B = 17; C = 5; D = 1; >D = 1
73	A = 84; B = 14; C = 2
74	A = 69; B = 27; C = 4
76	A = 36; B = 23; C = 13; D = 4; E = 5; F = 7; G = 12
77	A = 34; B = 37; C = 15; D = 4; E = 2; F = 3; G = 5
78	A = 56; B = 30; C = 11; D = 2; >D = 1
79	A = 42; B = 38; C = 14; D = 5; E = 1
80	A = 44; B = 37; C = 14; D = 4; E = 1
81	A = 39; B = 34; C = 16; D = 4; E = 2; F = 2; G = 3
82	A = 73; B = 20; C = 5; D = 1; >D = 1
83	A = 52; B = 32; C = 10; D = 3; E = 1; F = 1; G = 1
84	A = 39; B = 34; C = 12; D = 3; E = 2; F = 3; G = 7
85	A = 54; B = 30; C = 12; D = 3; E = 1
86	A = 43; B = 36; C = 16; D = 3; >D = 2
87	A = 49; B = 11; C = 6; D = 1; E = 5; F = 20; G = 8
88	A = 87; B = 12; C = 1
89	A = 62; B = 31; C = 6; >C = 1
90	A = 18; B = 32; C = 12; D = 13; E = 3; F = 9; G = 13
91	A = 83; B = 11; C = 3; D = 2; >D = 1
92	A = 33; B = 17; C = 16; D = 12; E = 7; F = 7; G = 8
93	A = 12; B = 28; C = 24; D = 15; E = 10; F = 7; G = 4
95	A = 24; B = 21; C = 20; D = 15; E = 8; F = 8; G = 4
96	A = 28; B = 27; C = 20; D = 13; E = 6; F = 4; G = 2
98	A = 9; B = 27; C = 35; D = 17; E = 5; F = 5; G = 2
99	A = 7; B = 24; C = 40; D = 20; E = 4; F = 3; G = 2
100	A = 8; B = 8; C = 14; D = 11; E = 12; F = 27; G = 20
101	A = 3; B = 7; C = 9; D = 10; E = 18; F = 35; G = 18
102	A = 19; B = 21; C = 22; D = 15; E = 16; F = 6; G = 1
103	A = 34; B = 27; C = 21; D = 9; E = 3; F = 4; G = 2
104	A = 33; B = 52; C = 6; D = 6; E = 2; >E = 1
105	A = 8; B = 9; C = 17; D = 23; E = 21; F = 20; G = 2
106	A = 2; B = 7; C = 13; D = 12; E = 22; F = 34; G = 10
107	A = 9; B = 20; C = 23; D = 21; E = 13; F = 12; G = 2
108	A = 94; B = 5; B = 1
109	A = 29; B = 31; C = 23; D = 11; E = 3; F = 2; G = 1
110	A = 44; B = 25; C = 19; D = 7; E = 2; F = 2; G = 1
111	A = 20; B = 39; C = 25; D = 12; E = 3; >E = 1
112	A = 86; B = 11; C = 1; >C = 2
113	A = 32; B = 24; C = 20; D = 11; E = 5; F = 4; G = 4
114	A = 86; B = 7; C = 4; D = 2; >D = 1
115	A = 44; B = 27; C = 15; D = 6; E = 2; F = 3; G = 3
116	A = 31; B = 32; C = 17; D = 9; E = 7; F = 3; G = 1

Slope Classes

A = 0-2%
B = 2-6%
C = 6-12%
D = 12-18%
E = 18-25%
F = 25-35%
G = >35%

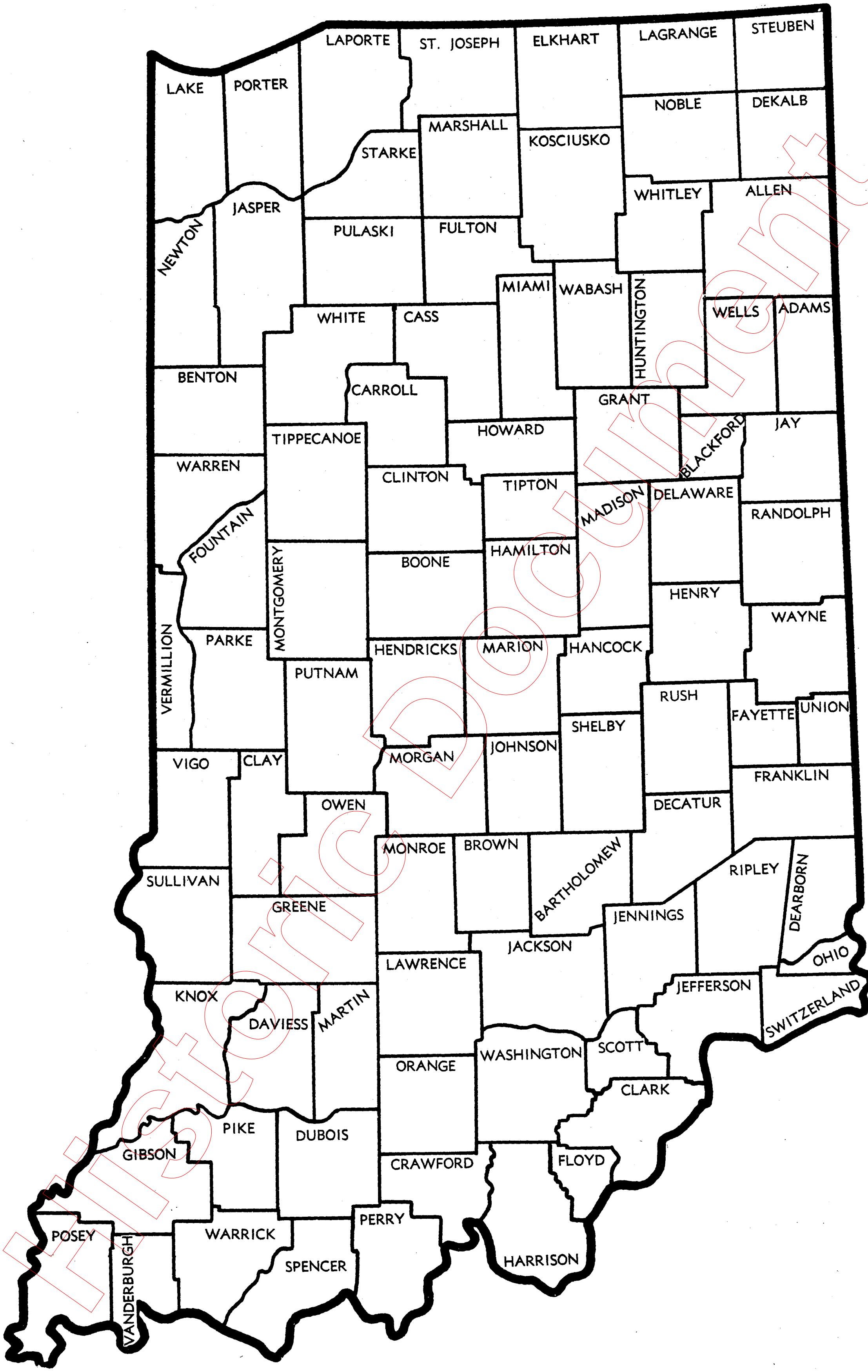
Table A-4. Associations with Less than 1 Percent CNI Sample.

Association number	Acres in state	Percent estimate	Number of counties
6	44,000	0.7	2
9	121,500	0.9	10
13	9,093	0.0	1
20	1,754	0.0	1
27	41,000	0.8	3
41	33,000	0.9	2
46	3,010	0.0	1
74	25,000	0.9	2
87	7,724	0.0	1
104	16,000	0.2	1
114	36,000	0.9	2

Table A-5. Number of Associations by Size Classes, Total Acreage, Percent in Indiana, Weighted CNI Sample and Range in Sample Size.

Association acreage	Number of associations	Total acreage	Percent of Indiana	Weighted percent sample	Range in percent sample
> 500,000	13	11,995,000	52	2.00	1.3-2.4
200,000-500,000	17	5,568,000	24	2.04	1.5-3.0
100,000-200,000	24	3,388,000	15	1.93	0.9-2.7
10,000-100,000	46	2,150,000	9	2.03	0.2-3.5
< 10,000	8	49,000	<1	1.62	0.0-6.4
Totals	108*	23,150,000	100		

*Eight of the original 116 associations were combined with others of greater extent before final preparation of the AY-50 series in 1971.


LAPORTE
ST. JOSEPH
ELKHART
LAGRANGE
STEUBEN
LAKE
PORTER
NOBLE
DEKALB
MARSHALL
KOSCIUSKO
STARKE
WHITLEY
ALLEN
JASPER
NEWTON
PULASKI
FULTON
MIAMI
WABASH
HUNTINGTON
WELLS
ADAMS
WHITE
CASS
BENTON
CARROLL
GRANT
JAY
HOWARD
TIPPECANOE
BLACKFORD
WARREN
CLINTON
TIPTON
DELAWARE
MADISON
RANDOLPH
FOUNTAIN
HAMILTON
BOONE
MONTGOMERY
HENRY
WAYNE
PARKE
VERMILLION
HENDRICKS
MARION
HANCOCK
PUTNAM
RUSH
FAYETTE
UNION
SHELBY
JOHNSON
MORGAN
VIGO
CLAY
FRANKLIN
OWEN
DECATUR
MONROE
BROWN
BARTHOLOMEW
RIPLEY
SULLIVAN
DEARBORN
GREENE
JENNINGS
JACKSON
LAWRENCE
OHIO
JEFFERSON
KNOX
MARTIN
DAVIESS
SWITZERLAND
SCOTT
WASHINGTON
ORANGE
CLARK
PIKE
DUBOIS
GIBSON
CRAWFORD
FLOYD
PERRY
POSEY
WARRICK
VANDERBURGH
SPENCER
HARRISON